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10/761,626	01/22/2004	Meng-An Pan	58268.00346	3538

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EXAMINER	
AGHDAM, FRESHTEH N	
ART UNIT	**PAPER NUMBER**
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02/19/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/761,626	PAN ET AL.	
	Examiner	Art Unit	
	Freshteh N. Aghdam	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 December 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed December 6, 2007 have been fully considered but they are not persuasive.

Applicant's Argument(s):

Regarding independent claims 1 and 10, the applicant argues that the claimed subject matter is not taught or suggested by Pikkarainen "converting the analog signal to an RF signal; and transmitting the RF signal."

Regarding independent claim 11, page 5, the applicant argues that it is not obvious to a person of ordinary skill in the art to up convert a signal to an RF (e.g. radio frequency) signal by utilizing a mixer.

Regarding the dependent claim 16, page 10, the applicant requests a new non-final office action to be issued since claim 16 is not addressed by the examiner.

Examiner's Response:

Regarding the first argument set forth above, the examiner disagrees with the applicant because Pikkarainen discloses using the disclosed modulation method and/ or apparatus in mobile phones **transmitting at radio frequency** (Col. 1, lines 13-18; Col. 4, lines 7-8). And, since the output of the analog signal is not already at radio frequency (Fig. 8, fIF); therefore, the analog signal yet to be up converted to radio frequency.

Regarding the second argument set forth above, the examiner disagrees with the applicant because one of ordinary skill in the art would recognize that is extremely well

known in the art to up convert a signal to radio frequency by employing a mixer. The examiner would like to present some documents supporting her statement as follow:

Peterzell et al (US 2003/0040292) see par. 99 and 102; Sahlman et al (US 2003/0040290) see par. 40; Smith (US 2003/0021367) see par. 3; and Feldman (US 2002/0149419) see par. 60.

Regarding the third argument set forth above, the subject matter of dependent claim 16 is addressed in dependent claim 6 by the examiner and since the rejection of dependent claim 6 is argued with respect to the primary reference and not the secondary reference used to reject the subject matter of claim 6. Therefore, the patentability of dependent claim 16 is already addressed by the applicant and as the result there is no need to issue a new non-final office action by the examiner.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 8, 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Pikkarainen et al (US 5,701,106).

As to claims 1 and 10, Pikkaraninen discloses a method of and/ or apparatus for modulating digital signal to higher frequency analog signal comprising: performing deta sigma modulation on a digital baseband quadrature signal (Fig. 8, block 91); converting

the modulated signal to an analog signal (block 92); converting the analog signal to an RF signal (Col. 1, lines 13-18; Col. 4, lines 7-8); and inherently transmitting the RF signal.

As to claim 2, Pikkaraninen further discloses that the modulation reduces the number of bits of the digital quadrature signal (Col. 5, lines 54-63).

As to claim 8, Pikkarainen discloses performing interpolation filtering on the digital quadrature signal before the delta sigma modulation (block 90).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pikkarainen et al, and further in view of Lipka (US 7,227,910).

As to claim 3, Pikkarainen discloses that the reduction is from n-bits to 1 bit. Pikkarainen is silent about the reduction is from 10 bits to 4 bits. However, one of ordinary skill in the art would recognize that such limitation is merely a matter of design requirement and it would have been obvious in the system of Pikkarainen reduction of the number of bits from 10 bits to 4 bits because using a digital to analog converter with a higher bit width makes it possible to use a lower oversampling factor, which has a positive effect on the power consumption and depending on what the limit is for power

consumption in that particular design the bit width could vary as it is evidenced by Lipka (Col. 2, lines 45-53). Therefore, it would have been obvious to one of ordinary skill in the art to reduce the number of bits from 10 to 4 for the reason stated above.

As to claim 4, Pikkarainen is not explicit about amplifying the RF signal prior to transmission. However, one of ordinary skill in the art would recognize that it is well known in the art to amplify the signal prior to transmission as it is evidenced by Lipka (Fig. 1, block 13) in order to adjust the signal gain prior to transmission as consequently improving the communication system performance.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pikkarainen et al.

As to claim 5, Pikkarainen discloses that the sigma delta modulation includes 1^{st} or 5^{th} order delta sigma modulation (Col. 5, lines 27-31). Pikkarainen is silent about the sigma delta modulation includes 2^{nd} order delta sigma modulation. However, one of ordinary skill in the art would recognize that such a limitation is merely a matter of design choice and would have been obvious in the system of Pikkarainen because the higher the order of the delta sigma modulator the less the quantization noise (i.e. the higher the signal to noise ratio). Therefore, using a 2^{nd} order delta sigma modulator and not for instance a 1^{st} order delta sigma modulator will result in higher signal to noise ratio. It would have been obvious to one of ordinary skill in the art to use a 2^{nd} order delta sigma modulator for the reason stated above.

Claims 6 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pikkarainen et al, and further in view of Hossack (US 6,819,276).

As to claim 6, Pikkarainen discloses all the subject matter claimed in claim 1, except for coding the modulated signal with a thermometer code. Hossack discloses a digital to analog converter that performs coding the modulated signal with a thermometer code (Fig. 3, block 120). Therefore, it would have been obvious to one of ordinary skill in the art to code the modulated signal of Pikkarainen with a thermometer code as Hossack discloses in order to reduce the number of bits that are in error.

As to claim 16, Pikkarainen discloses all the subject matter claimed in claim 11, except for coding the modulated signal with a thermometer code. Hossack discloses a digital to analog converter that performs coding the modulated signal with a thermometer code (Fig. 3, block 120). Therefore, it would have been obvious to one of ordinary skill in the art to code the modulated signal of Pikkarainen with a thermometer code as Hossack discloses in order to reduce the number of bits that are in error.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pikkaraninen et al, and further in view of Norsworthy et al (US 5,512,898).

As to claim 7, Pikkarainen discloses modulating the quadrature signal using one of frequency shift keying and phase shift keying (Col. 2, lines 1-12). Pikkarainen is not explicit about modulating the quadrature signal prior to performing delta sigma modulation. Norsworthy discloses modulating the quadrature signal using one of the frequency shift keying or phase shift keying modulations prior to delta sigma modulation

in order to highly efficiently transferring data by utilizing an I/Q modulation technique (Fig. 2, blocks 130 and 150; Col. 6, lines 7-11; Col. 10, lines 4-16). Therefore, it would have been obvious to one of ordinary skill in the art to perform I/Q modulation prior to delta sigma modulation for the reason stated above.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pikkaraninen et al, and further in view of Fujimori (US 6,236,912).

As to claim 9, Pikkarainen discloses all the subject matter claimed in claim 8, except for the interpolation filtering reduces the digital quadrature signal from 12 bits to 10 bits. Fujimori discloses that the interpolation filtering is capable of reducing the bit width by the interpolation rate change switch within the interpolation filter (Col. 6, lines 45-52). One of ordinary skill in the art would recognize that the exact value the bit width is a design requirement. Therefore, it would have been obvious to one of ordinary skill in the art to output a reduced the bit width signal by the interpolation filter of Pikkaraninen as taught by Fujimori in order to reduce the hardware complexity of the device/ circuitry.

Claims 11-12, 15, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pikkarainen et al.

As to claim 11, Pikkarainen discloses a method of and/ or apparatus for modulating digital signal to higher frequency analog signal comprising: performing deta sigma modulation on a digital baseband quadrature signal (Fig. 8, block 91); converting the modulated signal to an analog signal (block 92); converting the analog signal to an

RF signal (Col. 1, lines 13-18; Col. 4, lines 7-8); and inherently transmitting the RF signal. Pikkarainen is not explicit about using a mixer to up convert the analog signal to the RF signal. However, one of ordinary skill in the art would recognize that it is well known in the art to up utilize a mixer in order to up convert the intermediate signal to the RF signal to transmit the signal through radio frequency medium. Therefore, it would have been obvious to one of ordinary skill in the art to utilize a mixer to up convert the signal to the RF signal for the reason stated above.

As to claim 12, Pikkaraninen further discloses that the modulation reduces the number of bits of the digital quadrature signal (Col. 5, lines 54-63).

As to claim 15, Pikkarainen discloses that the sigma delta modulation includes 1^{st} or 5^{th} order delta sigma modulation (Col. 5, lines 27-31). Pikkarainen is silent about the sigma delta modulation includes 2^{nd} order delta sigma modulation. However, one of ordinary skill in the art would recognize that such a limitation is merely a matter of design choice and would have been obvious in the system of Pikkarainen because the higher the order of the delta sigma modulator the less the quantization noise (i.e. the higher the signal to noise ratio). Therefore, using a 2^{nd} order delta sigma modulator and not for instance a 1^{st} order delta sigma modulator will result in higher signal to noise ratio. It would have been obvious to one of ordinary skill in the art to use a 2^{nd} order delta sigma modulator for the reason stated above.

As to claim 18, Pikkarainen further discloses performing interpolation filtering on the digital quadrature signal before the delta sigma modulation (block 90).

Claims 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pikkarainen et al, and further in view of Lipka (US 7,227,910).

As to claim 13, Pikkarainen discloses that the reduction is from n-bits to 1 bit. Pikkarainen is silent about the reduction is from 10 bits to 4 bits. However, one of ordinary skill in the art would recognize that such limitation is merely a matter of design requirement and it would have been obvious in the system of Pikkarainen reduction of the number of bits from 10 bits to 4 bits because using a digital to analog converter with a higher bit width makes it possible to use a lower oversampling factor, which has a positive effect on the power consumption and depending on what the limit is for power consumption in that particular design the bit width could vary as it is evidenced by Lipka (Col. 2, lines 45-53). Therefore, it would have been obvious to one of ordinary skill in the art to reduce the number of bits from 10 to 4 for the reason stated above.

As to claim 14, Pikkarainen is not explicit about amplifying the RF signal prior to transmission. However, one of ordinary skill in the art would recognize that it is well known in the art to amplify the signal prior to transmission as it is evidenced by Lipka (Fig. 1, block 13) in order to adjust the signal gain prior to transmission as consequently improving the communication system performance.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pikkaraninen et al, and further in view of Norsworthy et al (US 5,512,898).

As to claim 17, Pikkarainen discloses modulating the quadrature signal using one of frequency shift keying and phase shift keying (Col. 2, lines 1-12). Pikkarainen is not

explicit about modulating the quadrature signal prior to performing delta sigma modulation. Norsworthy discloses modulating the quadrature signal using one of the frequency shift keying or phase shift keying modulations prior to delta sigma modulation in order to highly efficiently transferring data by utilizing an I/Q modulation technique (Fig. 2, blocks 130 and 150; Col. 6, lines 7-11; Col. 10, lines 4-16). Therefore, it would have been obvious to one of ordinary skill in the art to perform I/Q modulation prior to delta sigma modulation for the reason stated above.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pikkaraninen et al, and further in view of Fujimori (US 6,236,912).

As to claim 19, Pikkarainen discloses all the subject matter claimed in claim 18, except for the interpolation filtering reduces the digital quadrature signal from 12 bits to 10 bits. Fujimori discloses that the interpolation filtering is capable of reducing the bit width by the interpolation rate change switch within the interpolation filter (Col. 6, lines 45-52). One of ordinary skill in the art would recognize that the exact value the bit width is a design requirement. Therefore, it would have been obvious to one of ordinary skill in the art to output a reduced the bit width signal by the interpolation filter of Pikkaraninen as taught by Fujimori in order to reduce the hardware complexity of the device/ circuitry.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Freshteh N. Aghdam whose telephone number is 571-272-6037. The examiner can normally be reached on 9:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on 571-272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Freshteh N. Aghdam
Examiner
Art Unit 2611

February 6, 2008

CHIEH M. FAN
SUPERVISORY PATENT EXAMINER